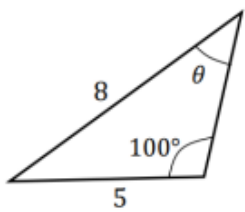
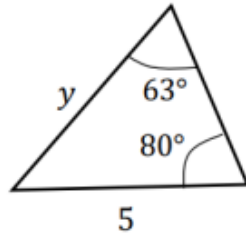
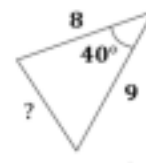


## C7. The Cosine Rule

Do now: work out the unknown, giving your answers to 3 significant figures

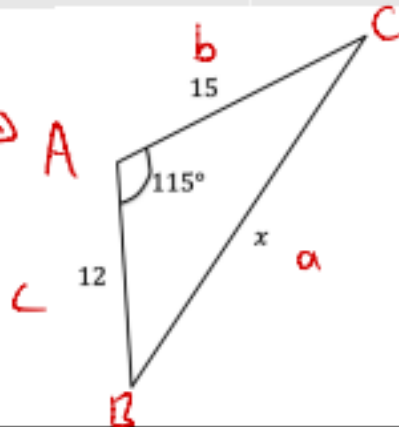
<p><b>1</b></p>  <p><math>38.0^\circ</math></p>	<p><b>2</b></p>  <p><math>y = 5.53</math></p>
--	--

#2 Two sides known and a missing side opposite a known angle	Remaining side	Cosine rule

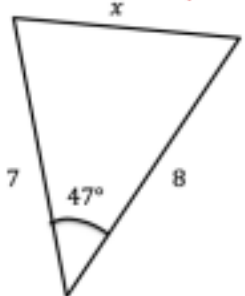
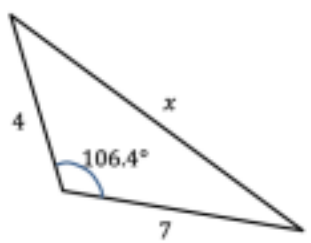



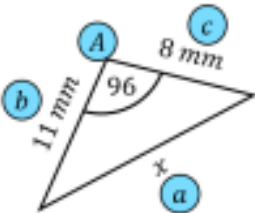
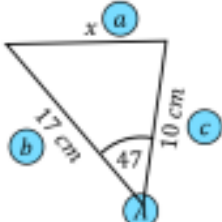
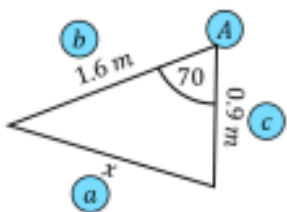
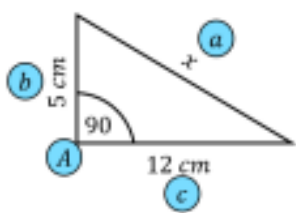
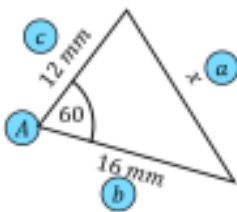

**Cosine Rule:**  
 $a^2 = b^2 + c^2 - 2bc \cos A$

*LABEL THE KNOWN ANGLE*  
*A*



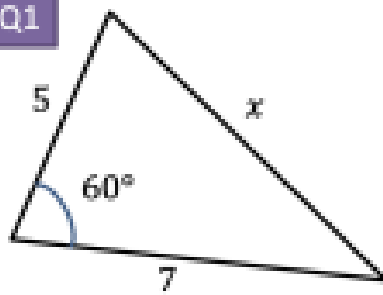
$x = 22.83$

 <p><math>x = 6.05</math></p>	 <p><math>x = 8.49</math></p>
--	--

Labelled diagram	Substitute into formula	$x^2$	$x$ to 1dp
	$x^2 = 7^2 + 5^2 - 2 \times 7 \times 5 \times \cos 76$	$x^2 = 57.065..$	$x = 7.6 \text{ cm}$
	$x^2 = 11^2 + 8^2 - 2 \times 11 \times 8 \times \cos 96$	$x^2 = 203.397..$	$x = 14.3 \text{ mm}$
	$x^2 = 17^2 + 10^2 - 2 \times 17 \times 10 \times \cos 47$	$x^2 = 157.120..$	$x = 12.5 \text{ cm}$
	$x^2 = 1.6^2 + 0.9^2 - 2 \times 1.6 \times 0.9 \times \cos 70$	$x^2 = 2.384..$	$x = 1.5 \text{ m}$
	$x^2 = 5^2 + 12^2 - 2 \times 5 \times 12 \times \cos 90$	$x^2 = 169$	$x = 13 \text{ cm}$
	$x^2 = 16^2 + 12^2 - 2 \times 16 \times 12 \times \cos 60$	$x^2 = 208$	$x = 14.4 \text{ mm}$
	$x^2 = 32^2 + 14^2 - 2 \times 32 \times 14 \times \cos 53$	$x^2 = 680.77..$	$x = 26.1$ (cm/mm/m)

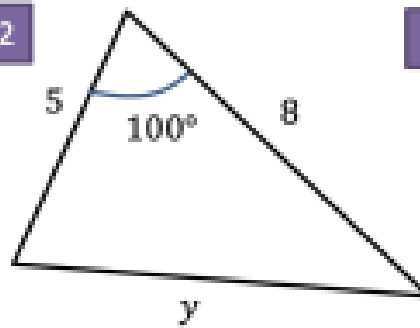
Use the cosine rule to determine the missing angle/side.

Q1



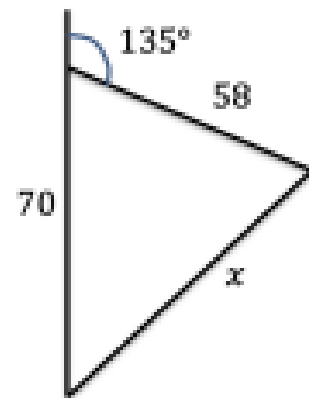
$$x = 6.24$$

Q2



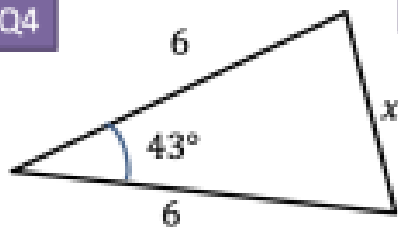
$$y = 10.14$$

Q3



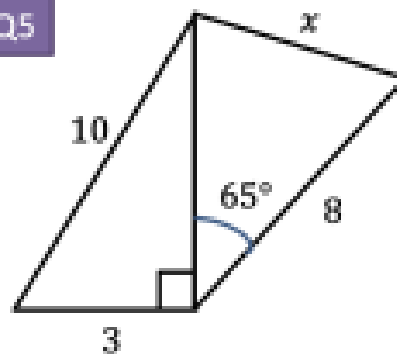
$$x = 50.22$$

Q4



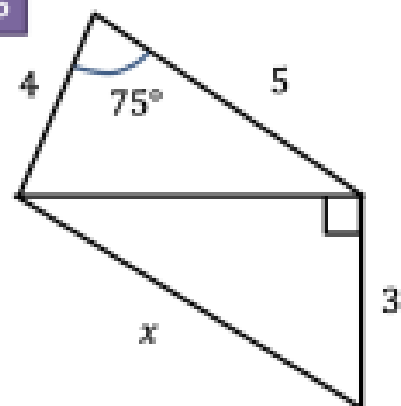
$$x = 4.398$$

Q5



$$x = 9.513$$

Q6



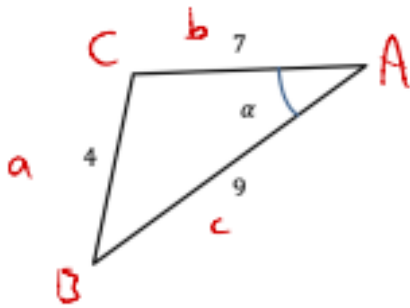
$$x = 6.2966$$

→ MAKE A THE SUBJECT

$$A = \cos^{-1} \left[ \frac{b^2 + c^2 - a^2}{2bc} \right]$$

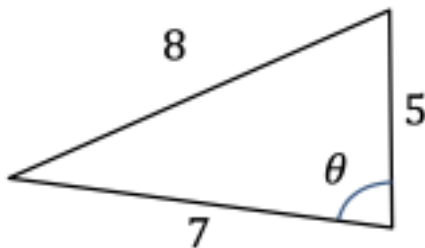
You have	You want	Use
All three sides	An angle	Cosine rule

$$a^2 = b^2 + c^2 - 2bc \cos A$$

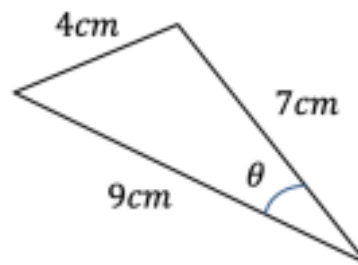


$$\alpha = 25.2^\circ$$

Test your understanding

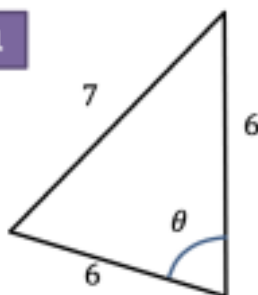


$$\theta = 81.79^\circ$$



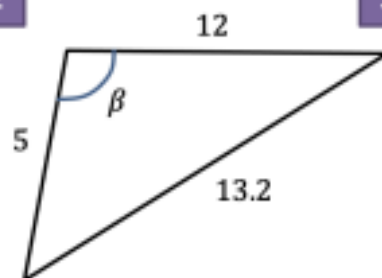
$$\theta = 25.21^\circ$$

1



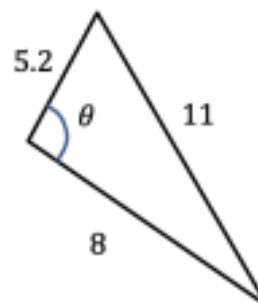
$$\theta = 71.4^\circ$$

2

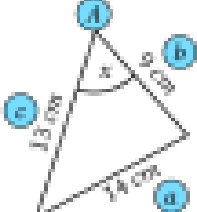
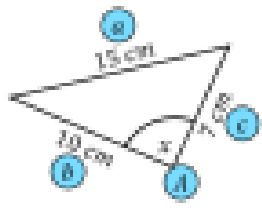
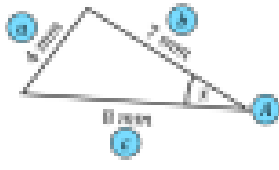
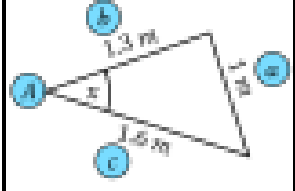
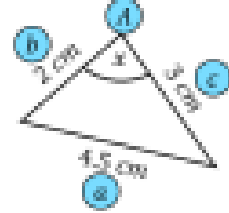
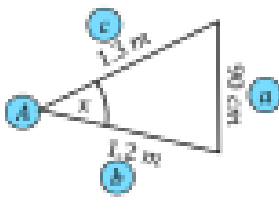
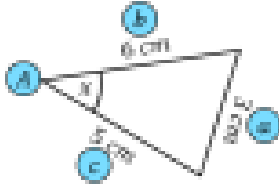


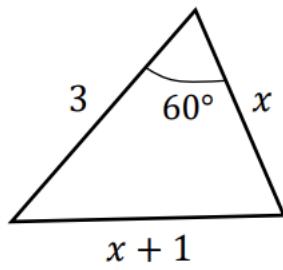
$$\beta = 92.5^\circ$$

3



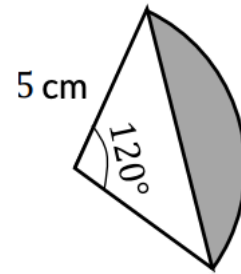
$$\theta = 112.1^\circ$$

Labelled diagram	Substitute into formula	Rearrange formula	Angle (1dp)
	$14^2 = 9^2 + 13^2 - 2 \times 9 \times 13 \times \cos x$	$\cos x = \frac{9^2 + 13^2 - 14^2}{2 \times 9 \times 13}$	$x = 76.7^\circ$
	$15^2 = 10^2 + 7^2 - 2 \times 10 \times 7 \times \cos x$	$\cos x = \frac{10^2 + 7^2 - 15^2}{2 \times 10 \times 7}$	$x = 122.9^\circ$
	$4^2 = 7^2 + 8^2 - 2 \times 7 \times 8 \times \cos x$	$\cos x = \frac{7^2 + 8^2 - 4^2}{2 \times 7 \times 8}$	$x = 30.0^\circ$
	$1^2 = 1.3^2 + 1.6^2 - 2 \times 1.3 \times 1.6 \times \cos x$	$\cos x = \frac{1.3^2 + 1.6^2 - 1^2}{2 \times 1.3 \times 1.6}$	$x = 38.6^\circ$
	$4.5^2 = 2^2 + 3^2 - 2 \times 2 \times 3 \times \cos x$	$\cos x = \frac{2^2 + 3^2 - 4.5^2}{2 \times 2 \times 3}$	$x = 127.2^\circ$
	$0.9^2 = 1.2^2 + 1.3^2 - 2 \times 1.2 \times 1.3 \times \cos x$	$\cos x = \frac{1.2^2 + 1.3^2 - 0.9^2}{2 \times 1.2 \times 1.3}$	$x = 42.0^\circ$
	$3^2 = 6^2 + 5^2 - 2 \times 6 \times 5 \times \cos x$	$\cos x = \frac{6^2 + 5^2 - 3^2}{2 \times 6 \times 5}$	$x = 29.9^\circ$



Determine the value of  $x$ .

The diagram shows a third-circle. Determine the perimeter of the shaded region.



Answers

$$x = 1.6$$

$$5\sqrt{3} + \frac{10}{3}\pi = 19.1 \text{ cm}$$